Soil Characterization Field Measurements Protocol

Purpose

To characterize the soils at the selected sites

To obtain additional site information

To gather samples from each horizon in order to perform later soil tests in the classroom

Overview

This protocol is divided into five tasks. In the first task, students will expose a 1 meter deep soil profile and identify the soil horizons. When this is not possible, a sample 10 cm deep can be taken to use for characterization. In the second task, students characterize the horizons by observing seven properties of soil layers. The students then perform the *Infiltration Protocol*, obtain additional site information, and take soil samples to use in determining bulk density, soil particle size distribution, soil pH, and soil fertility. In the final task, soil samples will be taken to the classroom and the drying of the samples begun.

Time

Preparation of materials - up to one class period

Soil pit including digging – up to one school day

Identifying horizons and taking samples from a soil pit - one or two class periods

Exposing and characterizing the soil profile using an auger and sampling – one or two class periods

Characterizing and taking a soil sample from 10 cm depth – one class period

Level

All

Frequency

Once at each of at least two sites (Soil Moisture Study Site and Biology Study Site).

Three samples of each horizon must be taken in the field for the *Soil Characterization Lab Analysis Protocol.*

Key Concepts

- Soil horizon
- Soil profile
- Color
- Texture
- Structure
- Consistence
- Free carbonates
- Bulk density
- Root distribution
- Soil measurements may be influenced by external factors such as land use, vegetation type, climate, parent material, and topography.
- Sampling procedures

Skills

- *Describing* soil characteristics
- *Using* a clinometer
- *Describing* a landscape
- *Collecting* samples
- *Preparing* samples for lab analysis

Materials and Tools

- Garden trowels
- Shovels
- Dutch or other auger (See *Toolkit* for specifications)
- Water bottle with squirt top (e.g. a well-rinsed dish-washing liquid bottle) or atomizer with a trigger for wetting soil)
- Plastic sheet, tarp, board, or other surface on which to lay out a soil profile removed using the auger
- Soil color book
- Nalgene acid bottle filled with distilled white vinegar

Bulk density sample containers (or other sample containers if your school is not equipped to do bulk density measurements)
Block of wood
Hammer
Meter Stick or tape measure or chop sticks with metric units
20 nails, golf tees, or chop sticks for marking lower and upper boundaries of horizons
Soil Characterization Data Work Sheet
Bulk Density Data Work Sheet
Soil Characterization Information Sheet
Pencils
Water Proof Marker
Clip boards
Small towel for cleaning hands
Plastic bags or sealable containers roughly one-liter in size for transporting soil samples
One roll of tape for sealing the sample bags, cans, or other containers
A box, sack, or bucket for transporting soil samples to the classroom
One waterproof marker for labeling the sample bags
Clinometer for measuring slope (see *Land Cover/Biology Investigation*)
A camera and color film or a digital camera for photographing the soil profile and landscape (slides are acceptable)
GLOBE Science Notebooks

Preparation

Select the site, obtain permission to dig, prepare the bulk density containers, gather the other tools and materials, have the pit dug.

Prerequisites

Preliminary discussion of soil horizons, structure, color, consistence, texture, free carbonates, and bulk density

Preparation

Secure the Soil Characterization Data Work Sheet (one copy is enough for six horizons) on a clipboard.

Take along the Soil Characterization Information Sheet from the *Appendix* to help you take the field measurements, the MUC system pages including definitions (from the *Land Cover/Biology Investigation*), and your GLOBE Science Notebooks.

Assemble all the field measurement equipment:

- Digging equipment as appropriate: auger(s), shovel(s), garden trowel(s)
- Meter stick or tape measure with metric units
- Nails, chopsticks, golf tees, etc.
- Soil color book
- Squirt bottle(s) with water
- Acid bottle filled with distilled white vinegar
- Bulk density sample containers (or other sample containers if your school is not equipped to do bulk density measurements)
- Plastic bags or sealable containers roughly one liter in size for transporting soil samples
- Clinometer
- One roll of tape for sealing the sample bags, cans, or other containers
- A box, sack, or bucket for transporting soil samples to the classroom
- Hand towel(s)
- Pencils
- Waterproof marker(s)
- Camera
- GPS if available

In addition for the auger technique:

- Plastic bag, tarp, board, or other surface on which to lay out the soil profile
- Copies of the Bulk Density Data Work Sheet for the Auger Technique (one copy is needed for each horizon so have at least five copies available)

How to Expose and Identify Soil Horizons

Soil Pit Technique

With this technique, students (or others) expose the soil profile by digging a soil pit.

1. Dig a pit one meter deep and as big around as is necessary to easily observe all of the soil horizons from the bottom to the top of the pit. As soil is removed from the pit, place the soil from each horizon in a separate pile. After the observations have been made and samples taken, the soil should be returned in the opposite order in which it was removed (i.e. the soil taken from the bottom of the pit should go in first, etc.).
2. If you need help to dig the soil pit, call upon parents, other teachers, custodians, student athletes, and local agricultural service personnel.
3. Have students look at the side of the soil pit on which the sun shines most directly so that soil properties will be clearly visible.
4. Starting from the top of the profile and moving down to the bottom, observe the soil profile closely to identify where there are changes in the appearance of the soil face.
5. Look carefully for any distinguishing characteristics like different colors, roots, the size and amount of stones, small light or dark nodules (called *concretions*), worms or other small animals and insects, worm channels, and anything else that is noticeable. If the soil is very dry, wetting it with your squirt bottle may help to distinguish color difference between horizons.
6. Mark the location of each of these changes or boundaries by sticking a nail, golf tee, chop stick, or other marker into the soil face. Sometimes it is difficult to identify differences in horizons because the properties of the whole soil profile are very similar. In this case, there may be only a few very thick horizons present. Do your best to record exactly what you observe in the field.
7. Measure the top and bottom depths for each horizon to the nearest cm and record them on Soil Characterization Data Work Sheet.
8. If horizons are very thin, (<3 cm from top to bottom) do not describe them as separate horizons; combine them with the horizon above or below instead. Thin horizons should be noted in your GLOBE Science Notebooks. Students who wish to do so can identify the horizons by letter name using the descriptions given in the Introduction Section.
9. Proceed to characterize the properties of each of the soil horizons identified. Perform this characterization as soon as possible after the pit is dug.
10. Once this protocol is completed, students should fill in the pit with the original soil. If there are educational or other reasons why the pit is not refilled immediately, take appropriate precautions to ensure that the pit is not a hazard.

Existing Exposed Soil Profiles (a road cut, excavation, etc.)

1. Obtain permission to take samples from the road cut, excavation, or other soil profile exposed by others. Obey any and all safety precautions requested.
2. Expose a fresh soil face by scraping the soil profile with the edge of the garden trowel or other digging tool to remove the surface layer.
3. Perform Steps 4 - 10 as given for the Soil Pit Technique.

Auger Technique

With this technique, students display the vertical soil profile on a horizontal surface (the ground). Be sure to use the correct auger for your site. A Dutch auger, as described in the *Toolkit* is best for most soil, especially for rocky, clayey, and dense soils. A sand auger is needed if your soil is very sandy in texture. In some places, the soil is mostly

peat and a special peat auger should be used. A bucket auger may be better for dry, desert soils.

1. Identify an area where you can dig four auger holes where the soil profiles should be similar.
2. Spread a plastic sheet, tarp, board, or other surface on the ground next to where you will dig your first hole.
3. Assemble a profile of the top 1 meter of the soil by removing successive samples from the ground with the auger and laying them end-to-end as follows:

   3.1. Turn the auger one complete revolution (360°) to dig into the ground.

   3.2. Remove the auger with the sample in it from the hole.

   3.3. Hold the auger over the plastic sheet, tarp, or board.

   3.4. Transfer the sample from the auger to the plastic sheet, tarp, or board as gently as possible. Place the top of this sample just below the bottom of the previous sample.

   3.5. Measure the depth of the hole. Adjust the sample on the plastic bag, tarp, or board so that its bottom is no further from the top of the soil profile than this depth.
4. Starting from the top and moving down to the bottom, observe the soil profile closely to identify where there are changes in the appearance of the soil.
5. Look carefully for any distinguishing characteristics like different colors, roots, the size and number of stones, small light or dark nodules (called *concretions*), worms or other small animals and insects, worm channels, and anything else that is noticeable.
6. Mark the location of each of these changes or boundaries by sticking a nail, golf tee, chop stick, or other marker into the soil profile you have constructed. Sometimes it is difficult to identify differences in horizons because the properties of the whole soil profile are very similar. In this case, there may be only a few very thick horizons present. Do your best to record exactly what you observe in the field.
7. Measure the top and bottom depths for each horizon to the nearest cm and record them on Soil Characterization Data Work Sheet(s).
8. If horizons are very thin, (<3 cm from top to bottom) do not describe them as separate horizons, but combine them with the horizon above or below instead. Thin horizons should be noted in your GLOBE Student Data Notebook. Students who wish to do so can identify the horizons by letter name using the descriptions given in the *Introduction* section.
9. Proceed to characterize the properties of each of the soil horizons identified. Perform this characterization as soon as possible after the hole is augered.
10. Once these tasks are completed, where ever possible, students should fill in the hole with the original soil.

Near Surface Sample Technique

1. In situations where it is not possible for you to expose the top meter of soil, an additional option is to use the top 10 cm of the soil as a single horizon sample for soil characterization.
2. Use a garden trowel or shovel to carefully remove the top 10 cm of the soil from a small area and set it on the ground.
3. Treat this sample as a horizon and proceed to characterize its properties.

How to Observe and Record Soil Properties

For each horizon identified, the following characteristics should be observed, recorded on the Soil Characterization Data Work Sheet, and reported to the GLOBE Student Data Server using the Soil Characterization Data Entry Sheet. Note: The soil characteristics should be observed in the order given.

1. Soil Structure

Take a sample of undisturbed soil in your hand (either from the pit or from the shovel or auger). Look closely at the soil in your hand and examine its structure. Soil structure is the shape that the

soil takes based on its physical and chemical properties. Each individual unit of natural soil structure or aggregation is called a *ped*. Possible choices of soil structure are granular, blocky, platy, columnar, and prismatic, and are shown in Figures SOIL-P-1 to 5.

Sometimes your soil may be structureless, which means that within a horizon, soil peds have no specific shape. In this case, the soil structure is either single grained or massive. Single grained is like sand at a beach or in a playground where there are individual sand particles that do not stick together. Massive is when the soil sticks together in a large mass that does not break in any pattern. These conditions are more commonly found in C horizons, the horizons in which the parent material is least altered. Since the parent material has not yet undergone any weathering, it usually has not developed any structure.

It is common to see more than one type of structure in a soil sample. Students should record on their data sheets only the structure type that is most common in their sample. They should discuss and agree upon the structure types they see. If the sample is structureless, record whether it is single-grained or massive.

Figure SOIL-P-1: Blocky Structure

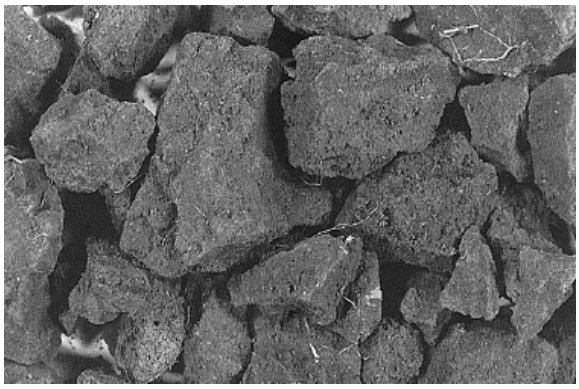

Figure SOIL-P-2: Columnar Structure

2. Soil Color

Take a ped from the horizon and note on the data sheet whether it is moist, dry, or wet. If it is dry, moisten it slightly with water from your water bottle. Break the ped and hold the color chart

Figure SOIL-P-3: Granular Structure

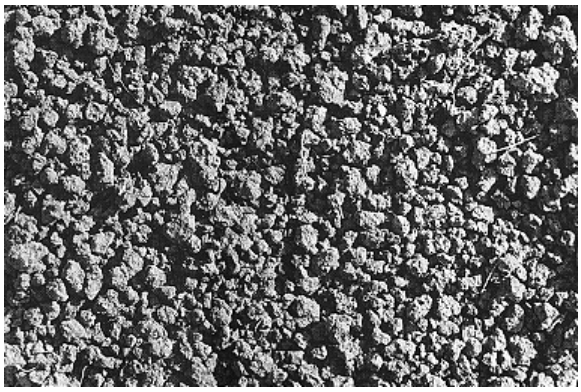

Figure SOIL-P-4: Platy Structure

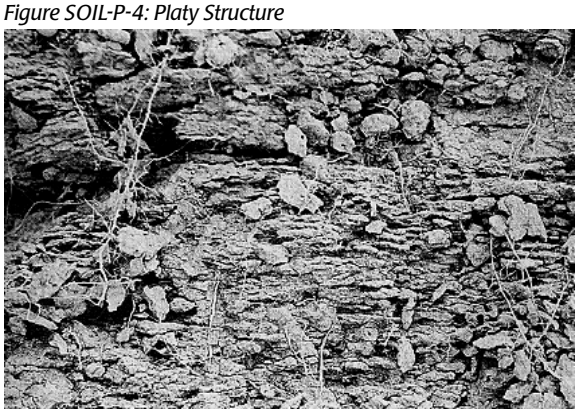

Figure SOIL-P-5: Prismatic Structure

next to it. Find the color from the color chart which most closely matches the color of the inside surface of the ped. Stand with the sun over your shoulder so that sunlight shines on the color chart and the soil sample you are examining. Record on the data work sheet the symbol of the color on the chart that most closely matches the soil's color.

Sometimes, a soil sample may have more than one color. Record a maximum of two colors if necessary, and indicate (1) the dominant (main) color, and (2) the sub-dominant (other) color. Again, students both inside and outside the pit should agree on the choice of color.

3. Soil Consistence

Take a ped from the soil horizon. Record on the data work sheet whether the ped is moist, wet or dry. If the soil is very dry, moisten the face of the profile by squirting water on it, and then remove a ped for determining consistence. Holding the ped between your thumb and forefinger, gently squeeze it until it pops or falls apart. Record one of the following categories of soil ped consistence on the data sheet.

Loose: You have trouble picking out a single ped and the structure falls apart before you handle it.

Friable: The ped breaks with a small amount of pressure.

Firm: The ped breaks when you apply a good amount of pressure and the ped dents your fingers before it breaks.

Extremely Firm: The ped can't be crushed with your fingers (you need a hammer!)

4. Soil Texture

The texture of a soil refers to the amount of sand, silt, and clay in a soil sample, and the composition of these determines the way the soil feels when you rub it between your fingers. The texture differs depending on the amount of sand, silt, and clay in the soil sample. Sand particles are the largest with sizes up to 2 mm while clay particles are smaller than .002 mm. Particles greater than 2 mm are called stones or gravels and are not considered to be soil material. Even though they are small, the differences among sand, silt, and clay particles can be felt, and each has its own characteristics. Sand feels gritty, silt feels smooth, and clay feels sticky. Usually a combination of these different size particles is found in a soil sample. Soil scientists use charts called textural triangles to help determine what percent of sand, silt, and clay are in a soil. Using Textural Triangles 1 and 2 to help you, follow these steps to identify your soil's texture.

4.1. Take a sample of soil about the size of a small egg and add enough water to moisten it. Work it between your fingers until it is the same moisture throughout. Then, squeeze it between your thumb and forefinger in a snapping motion to try to form a ribbon of soil.

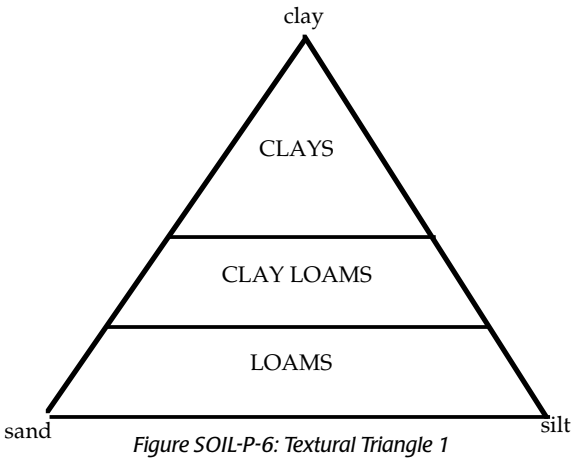

Figure SOIL-P-6: Textural Triangle 1

4.2. If the soil feels extremely sticky (sticks to your hands and is hard to work), stiff and requires a lot of thumb and finger pressure to form a ribbon, it is likely composed of mostly clay size particles. Classify it as a clay, as shown on Textural Triangle 1.

4.3 If the soil feels sticky and a little softer to squeeze, it probably has fewer clay particles. Classify it as a clay loam.

4.4 If the soil is soft, smooth, and easy to squeeze, and is at most slightly sticky, classify it as a loam.

Once the soil has been classified as clay, clay loam, or loam, refine the classification by determining the relative amounts of sand and silt.

4.5 If the soil feels very smooth, with no sandy grittiness, add the word "silt" or

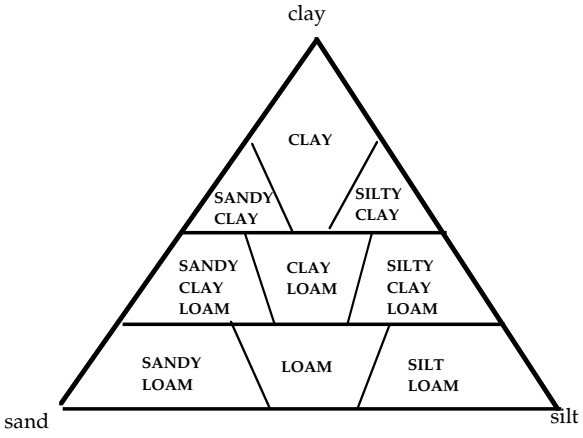

Figure SOIL-P-7: Textural Triangle 2

"silty" to your classification, such as "silty clay", or "silty loam", as shown on Textural Triangle 2. This means that your soil sample has more silt-size particles than sand-size particles.

4.6 If the soil feels very gritty, add the term "sandy" to your soil classification, such as "sandy clay". This means your soil sample has more sand size particles than silt size particles.

4.7 If the soil feels neither very gritty nor very smooth, even if you can feel some sand in your sample, keep your original classification unchanged. This means your soil sample has about the same amounts of sand and silt size particles, and in the case of a clay, it may have very few of either.

Note: When feeling the soil texture, try to add the same amount of water to each sample so that you can more accurately compare one texture to the other. The soil texture can feel differently depending on how wet or dry it is. The amount of organic matter in the soil can also change how it feels. Generally, the darker the soil color is, the more organic matter is in it.

4.8 Record on the data work sheet the name of the soil texture that the students agree on. Also, note whether the sample was dry, wet, or moist when it was examined, and whether it contained a lot of organic matter (for instance if it was on the surface and had a very dark color).

5. Presence of Roots

Observe and record if there are none, few, or many roots in the horizon.

6. Presence of Rocks

Observe and record if there are none, few, or many rocks or rock fragments in the horizon. A rock or rock fragment is defined as being larger than 2 mm in size.

7. Test for Free Carbonates

Perform this test by squirting vinegar on the soil. If carbonates are present, there will be a chemical reaction between the vinegar, and the carbonates to produce carbon dioxide. When carbon dioxide is produced, it bubbles or *effervesces*. The more carbonates that are present, the more bubbles (*effervescence*) you will observe.

7.1. Look carefully at your soil profile for white coatings on the soil and rocks which might indicate that free carbonates are present.

7.2. Set aside a portion of the pit, exposed soil face, or sample from the auger hole or near surface which you do not touch with your hands, and use it for the free carbonates test.

7.3. After you have finished characterizing the other soil properties, test for free carbonates. Open the acid bottle and starting from the bottom of the profile and moving up, squirt vinegar on the soil particles. Look carefully for the presence of effervescence.

7.4 Record one of the following as the results of the Free Carbonate Test for each horizon:

None: if you observe no reaction, the soil has no free carbonates present.

Slight: if you observe a very slight bubbling action; this indicates the presence of some carbonates.

Strong: if there is a strong reaction (many, large bubbles) this indicates that many carbonates are present.

7.5. Do not bring samples contaminated with the vinegar back to the classroom.

Obtain Additional Site Information

At the same time that students take their soil characterization measurements in the field, or within a few months thereafter, spend some time with your class describing and recording details about your site.

1. Measure and record the GPS coordinates of your site.
2. Perform the *Infiltration Protocol* for three places near your soil pit, auger hole, or surface sample, or above the road cut or other excavation. You do not need to measure infiltration on more than one day; the day you are collecting the other soil characterization data is usually a good day to take this measurement.
3. Photograph the soil profile that has been described. Do this on the day measurements are taken in the field.

   If students have exposed the soil profile by digging a soil pit or have used an existing exposed soil profile, place a tape measure or meter stick along the profile with the 0 cm mark at the ground surface.

   Photograph the profile face from outside the pit, preferably with the sun behind the photographer shining on the exposed profile.

   If the soil profile was obtained with an auger, photograph the soil profile lying on the paper or board on the ground with a tape measure or meter stick lying next to it. Again, have the 0 cm mark at the top or ground surface level of the profile, and have the sun behind the photographer.

   In either case, take another photograph of the landscape around the Soil Characterization Sample Site.

   Send copies of these photographs to the GLOBE Student Data Archive at the address given in the Implementation Guide, or if they were taken with a digital camera, submit them to the GLOBE Student Data Archive electronically.
4. Measure the slope of the sample site using the clinometer from the *Land Cover/Biology Investigation*, and record the slope measurement on the Soil Characterization Data Work Sheet.

   4.1 Designate two students whose eyes are at about the same height to measure the slope.

   4.2 Measure the steepest slope that crosses the hole.

   4.3 The student that holds the clinometer stands down slope and the other walks to the opposite side of the hole.

   4.4 Looking through the clinometer, one student sites the eye level of the other student.

   4.5 Read the angle of slope in degrees and record this reading on the data work sheet.
5. Measure and record the distance from major features (such as buildings, power poles, roads, etc.).
6. Record any other distinguishing characteristics that make this site unique. (While all of the following data will not be reported to GLOBE at the current time, such data should be recorded in the school's local database.)

   Questions you might ask are:

- What are the types of plants and animals you find in the soil and the general area around your site? Include small organisms in the soil such as earthworms or ants.
- What is the parent material from which the soil was formed? Was it bedrock? If so, look for rocks on the surface to tell you something about the kind of rock. Could your soil have been deposited by water or wind, by a glacier or volcano? If necessary, further investigate the surface geology of your area in your local library.
- Where in the landscape is your soil? Is it on a hilltop, slope, or bottom of a hill? Is it next to a stream or on a flat plain? On what kind of land form is it found?
- What is the general climate at your soil site? Is it sunny, shaded, hot, cold, moist, dry?
- What is the recent land use in this area? Has it been stable for a long time, or has it been plowed, its trees cut, used for

construction, or undergone some other disturbance recently?

7. Record all requested information on the Soil Characterization Data Work Sheet.

Information about your site and data collection techniques (often called metadata) should be entered permanently in your GLOBE Science Notebook and registered with your site using the Soil Characterization Sample Site Data Entry Sheet. You are not required to enter all this information, but it is of great help to scientists and others who want to use these data. A sample site must be defined before the soil characterization data for it can be entered. Initially, this definition can consist of no more than a name for the site and the date on which the field observations were made and the soil samples taken. As more information becomes available to characterize the sample site, these data can be added to the GLOBE Student Data Archive using the modify a sample site procedure.

Soil Sampling

The methods for obtaining soil samples for further analysis are different depending on how you have exposed your soil profile.

Soil Pit Technique and Existing Exposed Soil Profiles

Taking Bulk Density Samples

1. For each horizon in your soil profile, push a can with a known volume into the side of the horizon. The soil in the profile should be moist, so that it will stick together and so that the can will go in easily. If necessary, wet the soil before doing this measurement.
2. If it is still difficult to push the can into the soil, you may need to use a hammer or other object to force it in. If this is necessary, place a piece of wood over the can and hit the wood with the hammer to spread the force of the hammer blow to all edges of the can at once and to minimize denting the can.

   Note: Some denting is allowed in this procedure as long as the volume of the can is not changed by more than a few percent, but if the can dents too badly, the soil may be too hard or rocky to take a bulk density sample this way. You might consider taking a bulk density sample using the auger method described below, instead, for the dense horizons.
3. Stop when you can see some of the soil poking through the small hole in the bottom of the can, the can has been filled with soil.
4. Using a trowel or shovel, remove the can and the soil surrounding it. Trim the soil from around the can until it is flat against the edges of the can so that the volume of the soil is the same as the volume of the can.
5. Cover the can with the lid or other cover and return it to the classroom.
6. Repeat this procedure so that you have 3 bulk density samples for each horizon.
7. Label the cans in the field with the site name, horizon number (or letter), top and bottom depths, and sample number (1, 2 or 3 for each horizon).
8. Bring these samples in from the field as soon as possible.
9. Remove the covers.
10. Weigh each sample in its can and record this moist weight on the Bulk Density Data Work Sheet.
11. Place the samples in the soil drying oven.

If you are not measuring bulk density:

1. Dig an ample sample from each soil horizon. Avoid the area of the soil face which was tested for carbonates and avoid touching the soil samples so that your pH measurements will not be contaminated.
2. Place each sample in a bag or other soil container.
3. Label each bag with the site name, horizon number (or letter), and top and bottom depths.
4. Bring these samples in from the field.
5. Spread the samples on separate plastic plates or sheets of newspaper to dry in the air.

Auger Technique

Three samples are needed from each horizon. Each will be obtained from a new auger hole.

Taking Bulk Density Samples:

For each auger hole:

1. Auger to a depth 1 or 2 cm past the top of the horizon to be sampled.
2. Measure the depth of the hole.
3. Use the auger to remove a sample of the horizon. If the horizon has a smaller vertical extent than the length of the auger head, only perform a partial turn of the auger so that the whole sample will be from just this horizon. Do not turn the auger more than one complete circle (360°) so that the soil does not become compacted.
4. Once the sample is removed, transfer all the soil from the auger head to a sample container without losing any on the ground. Avoid handling the sample as much as possible to minimize the soil contamination by natural oils from your skin.
5. Measure the diameter of the hole that the auger made, and the depth of the hole.
6. Label the outside of the container with the horizon name, the diameter of the hole, and depth of the hole before and after this sample was removed. (These measurements will be used to calculate the volume of the sample.)
7. Repeat steps 1 - 6 for each horizon in the soil profile.
8. Repeat this procedure in different holes, next to each other, so that you obtain 3 samples of each horizon.
9. Cover or seal the samples and transport them to the classroom.
10. Bring these samples in from the field as soon as possible.
11. Remove the covers.
12. Weight each sample in its container and record this moist weight on the Bulk Density Data Work Sheet.
13. Place the samples in the soil drying oven.

If you are not measuring bulk density:

For each auger hole:

1. Auger to a depth 1 or 2 cm past the top of the horizon to be sampled.
2. Use the auger to remove a sample of the horizon. If the horizon has a smaller vertical extent than the length of the auger head, only perform a partial turn of the auger so that the whole sample will be from just this horizon.
3. Place the sample in a bag or other soil container. Avoid contaminating the sample by touching it with your hands.
4. Label each bag with the site name, horizon name, and top and bottom depths of the horizon.
5. Repeat Steps 1 - 4 for each horizon.
6. Bring these samples in from the field. Spread the samples on separate plastic plates or sheets of newspaper to dry in the air.

Near Surface Sample Technique

Taking Bulk Density Samples:

1. Choose 3 locations close to the location where you performed your *Soil Characterization Protocol*.
2. Remove vegetation and other material from the soil surface.
3. For each of the 3 locations:

   3.1. Push a can with a known volume into the surface of the soil. The soil in the profile should be moist, so the soil will stick together, and the can will press into the ground easily. If necessary, wet the soil before doing this measurement. Let the moisture seep into the soil before sampling. It is preferable to sample moist soils and not wet soils unless the soil is naturally saturated with water.

   3.2. Stop when you can see some soil poking through the small hole in the bottom of the can, you have filled the can.

   3.3. If it is difficult to push the can into the soil, you may need to use a hammer or other object to force it in. If this is







necessary, place a piece of wood over the can and hit the wood with the hammer to spread the force of the hammer blow to all edges of the can at once and to avoid denting the can.

3.4. Slide a trowel or shovel under the can and the soil surrounding it and lift it out carefully. Trim the soil from around the can until it is flat against the edges of the can so that the volume of the soil is the same as the volume of the can.

3.5. Cover the can with the lid or seal it for transport back to the classroom.

3.6. Label the cans in the field with the site location and the number of the sample (i.e. 1, 2 or 3).

4. Bring these samples in from the field as soon as possible.
5. Remove the covers.
6. Weigh each sample in its can and record this moist weight on the Bulk Density Data Work Sheet.
7. Place the samples in the soil drying oven.

If you are not measuring bulk density:

1. Dig an ample sample from the top 10 cm of the soil. Avoid the area which was tested for carbonates, and avoid touching the soil samples so that your pH measurements will not be contaminated.
2. Place each sample in a bag or other soil container.
3. Label each bag with the site name, horizon name, and top and bottom depths.
4. Bring these samples in from the field.
5. Spread the samples on separate plastic plates or sheets of newspaper to dry in the air.